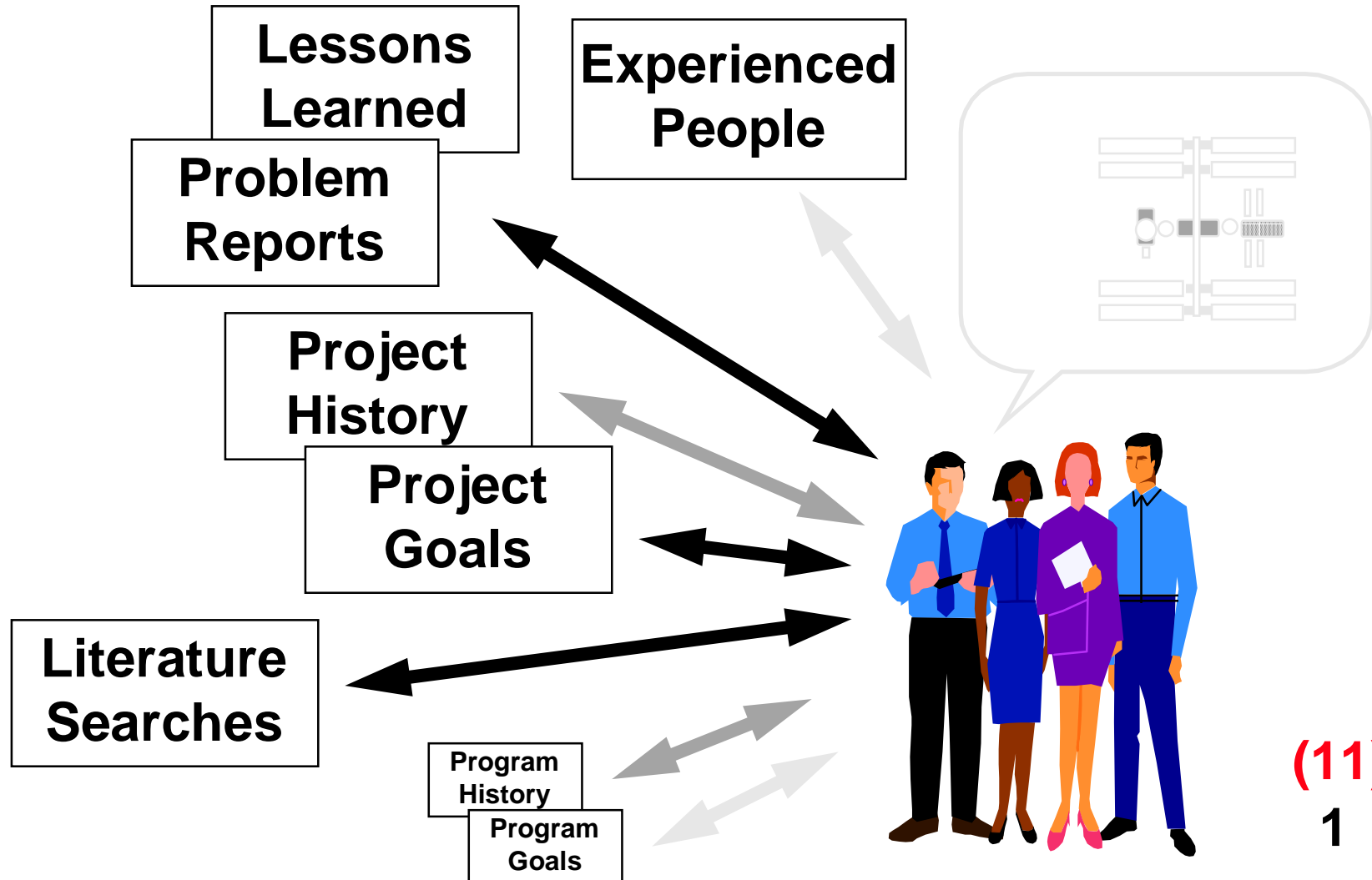


PROBLEM REPORTING & LESSONS LEARNED



PROBLEM/FAILURE REPORTING SYSTEM

- **Definition: A Problem/Failure Reporting and Corrective Action System is a procedure by which testing and process anomalies as well as any failure or noted deviation from standards, the cause and corrective action are reported on, properly investigated and documented .**

Benefits

- **This documentation provides a history for future problems and lessons learned in order to avoid similar occurrences.**
- **There is assurance that problems are properly handled, investigated and that appropriate corrective action takes place.**
- **The procedure allows independent investigators (when a Failure Review Board is used) to provide new insight to problems.**
- **Testing anomalies discover hidden problems related to the system.**
- **Manufacturing anomalies discover hidden problems with the manufacturing process.**

OBJECTIVES

Be able to answer (or know):

- **Why are problem reports important?**
- **How are they to be submitted?**
- **What are the key sections of a problem/failure report form? Explain each.**
- **Why are failure review boards held?**
- **What are lessons learned and what is their aim?**
- **What are the key features of a lesson learned?**
- **Know how to access your lessons learned data base.**

OUTLINE

OVERVIEW

PROBLEM REPORTING

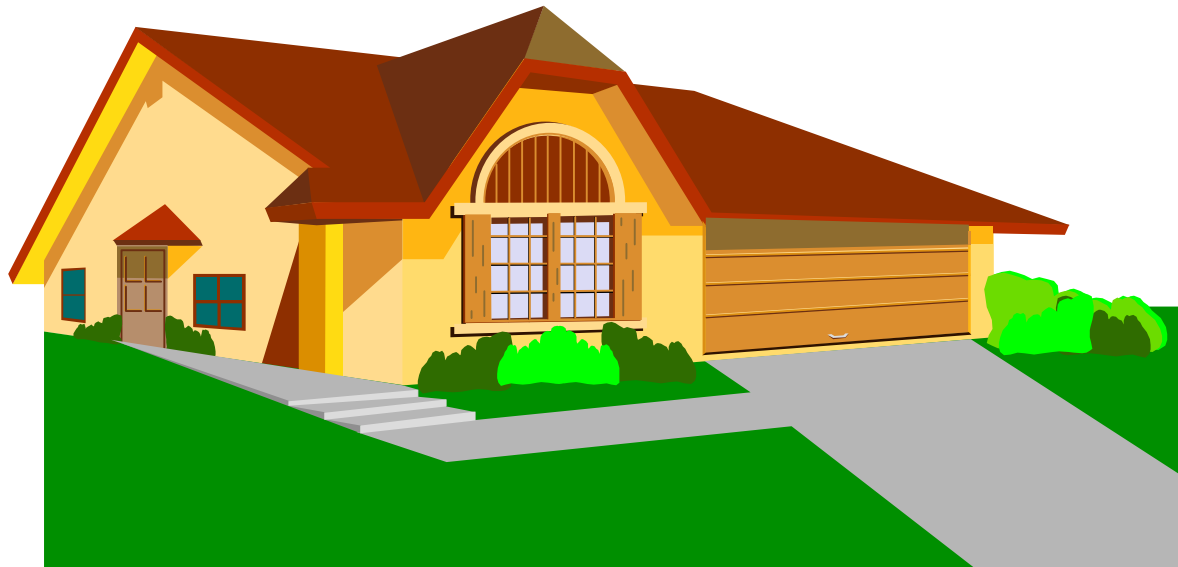
- Typical Systems
- Learn From Each Failure
- Procedure/ Filling Out Forms
- Database Considerations
- Failure Review Boards
- Suggestions

LESSONS LEARNED

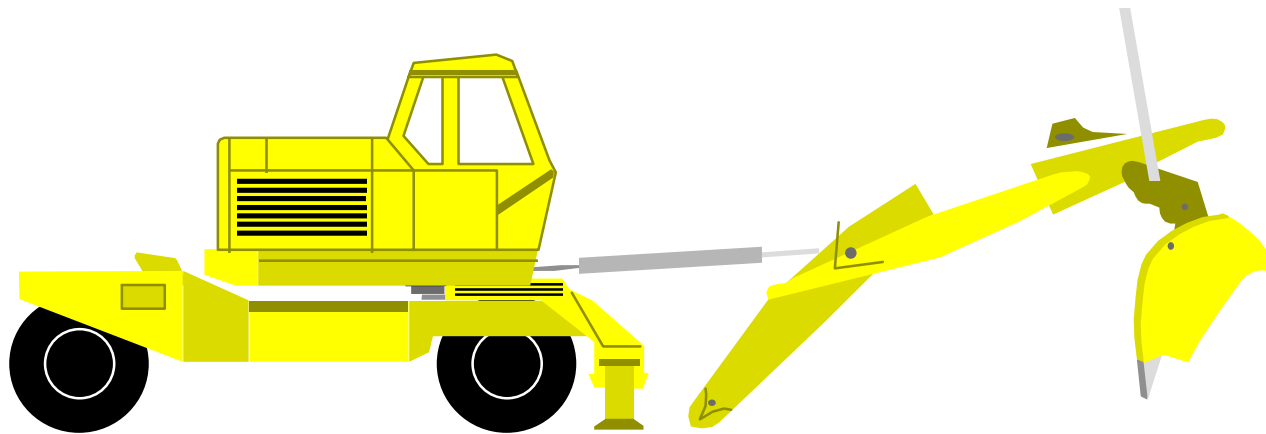
- Typical Lessons Learned System
- Procedure for Submittal
- The Lessons Learned Format

OVERVIEW -- Nothing Exists In A Vacuum of and by Itself.

- This house just came along by itself!



OVERVIEW -- Nothing Fails “by Itself.”



OVERVIEW -- With any Problem Ask the Questions:

- **What caused this problem?**
- **What is the history of this problem?**
- **How did this thing come about?**
- **What were the design ideas that were behind this item or component or thing or box?**
- **How can I benefit from other peoples mistakes?**
- **How can I benefit from other peoples successes?**
- **What we the Lessons Learned on previous similar projects?**
- **What type of failures occurred on similar projects?**

PR: Typical Systems

- **Failure Reporting, Analysis and Corrective Action System (FRACAS)**
 - A closed loop failure reporting, analysis and Corrective Action System is essential for the achievement of reliability goals.
- **JPL Problem /Failure Reporting System**
 - A highly sophisticated problem failure reporting system that can be customized for individual projects, provides electronic routing of forms and provides optical disk drives for storage of non-text information.

PR: System Organization

- **Key management tool.**
- **Nonpunitive problem Identification.**
- **Problem risk rated to focus attention on significant issues with residual risk.**
- **Line organization responsible for analysis and corrective action (overview by task/project and reliability).**
- **Project office has final approval authority on all risk issues.**

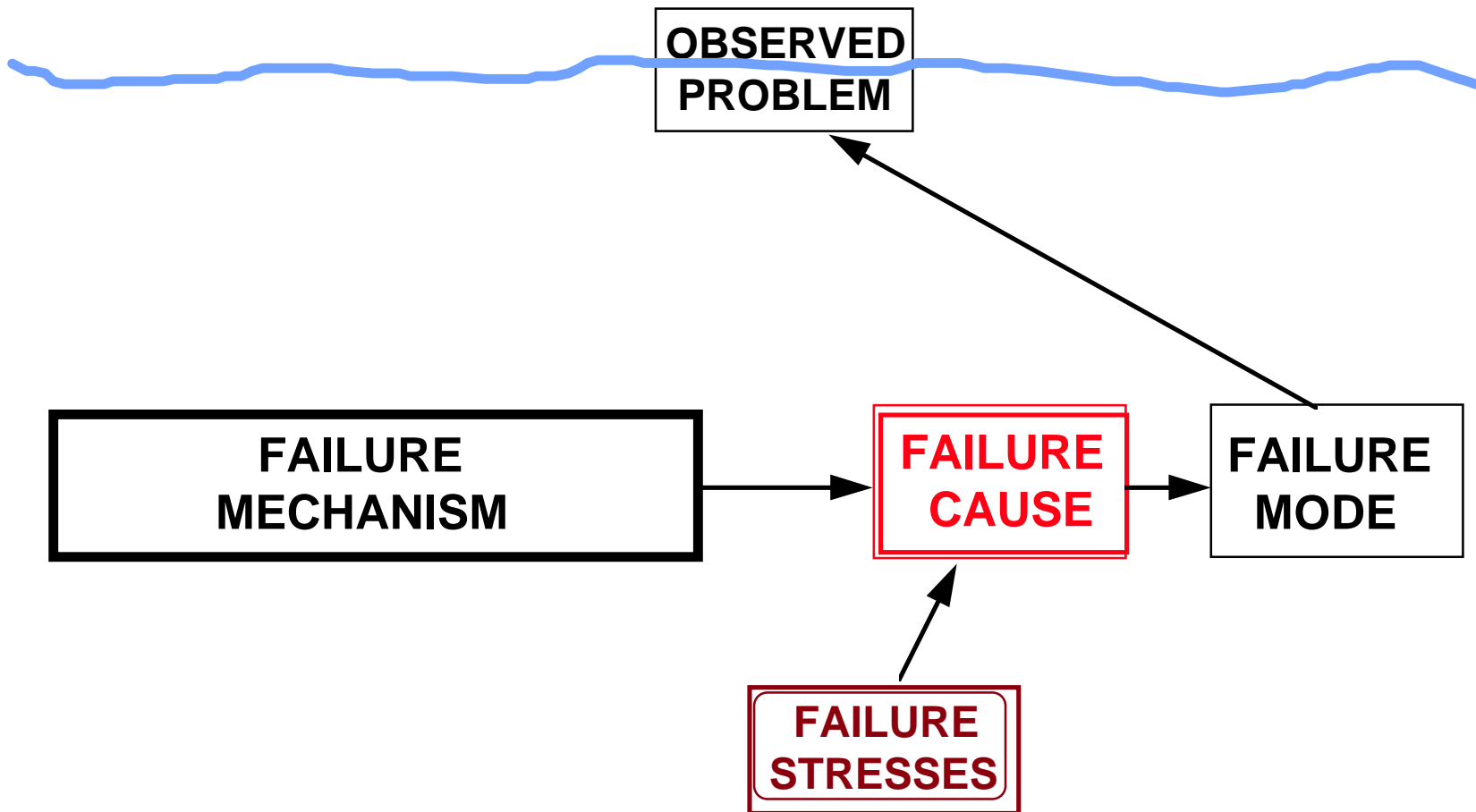
PR: Importance of Learning From Each Failure

- **When a product fails, a valuable piece of information about it has been generated because we have the opportunity to learn how to improve the product if we take the right actions.**

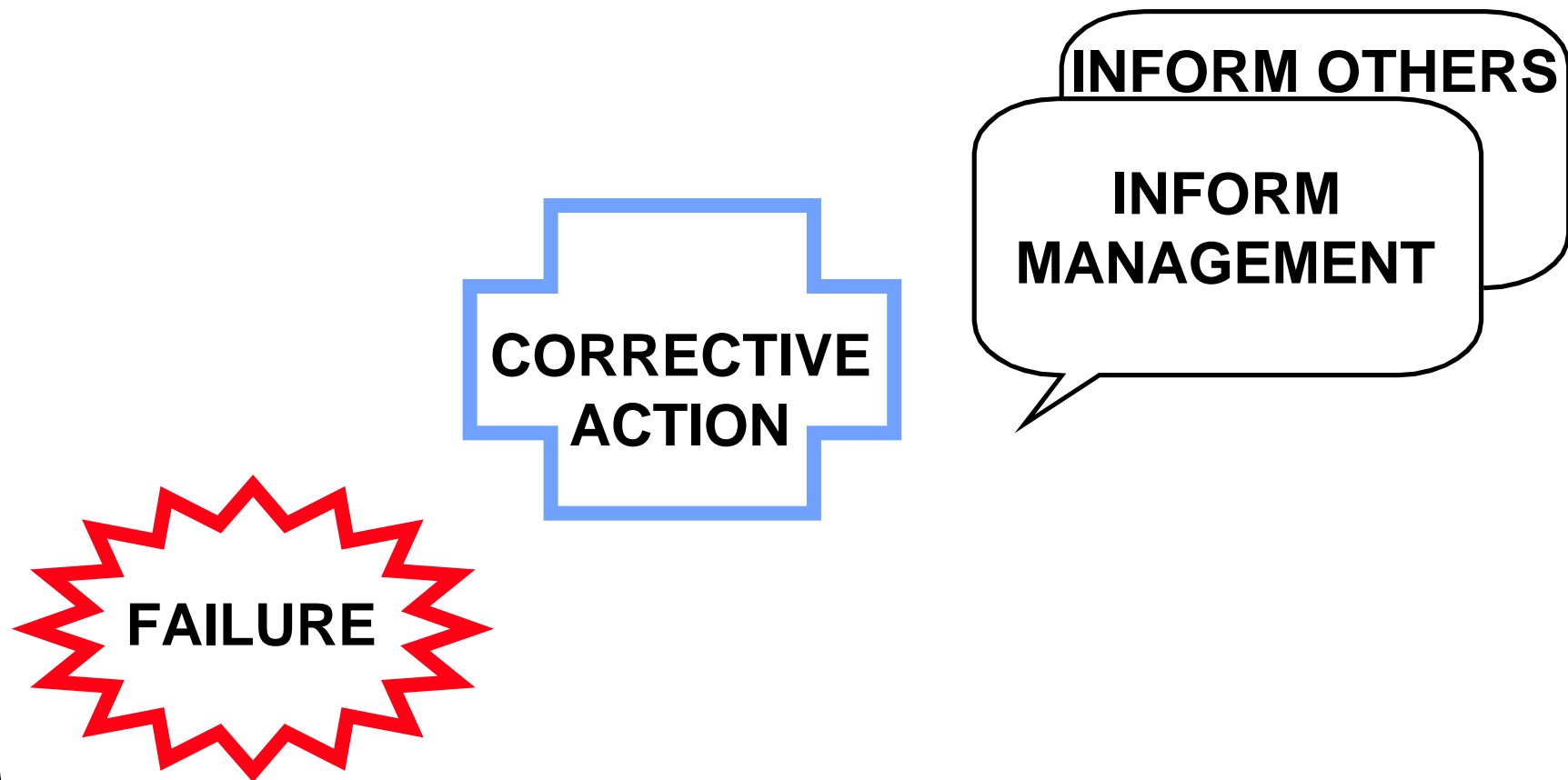
PR: Results of Analyzing Failures:

- **Corrective Action ensures that the cause is dealt with.**
- **Concurrence informs management of actions being taken to avoid another failure. This data enable all personnel to compare the part ratings with the use stresses and verify that the part is being used with a known margin.**

PR: The Tip of the Iceberg



PR: What Comes After The Correct Analysis of the Failure?



PR: Procedure

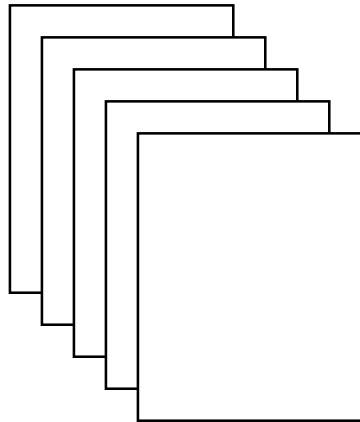
Don't close a PFR until the work is done!

Procedure for closure:

- **Failure mode is the observed event or anomaly that something is wrong or something has changed or that something is not going according to plan.**
- **Analysis must address the problem. Analysis must address the effect on other items.**
- **Corrective action must address the analysis and the problem and the corrective action must be implemented.**
- **The item must have passed through the event that caused the PFR. (e.g. a retest to confirm that the item is now OK or that the problem can be duplicated)**

PR: Procedure: Typical Forms

- See forms in back of section



Hints:

- Customize the forms to fit your needs, Keep them on one side of a page if possible, Keep them simple and easy to fill out. Get Approvals.

PR: Filling Out Forms-Definitions

- **Unit/Box Name**
 - T1 VSAT, FEU
- **Assembly Name/Part Number/Serial Number**
 - Low Noise Converter(LNC),P/Nxxxxxxxxx,
S/Nxxxxxxxxx.
- **Date/Time/Hours on Unit**
 - 02-15-94/10:50 am/456 hr.
- **Test or activity being performed.**
 - BER test A
- **Date(s)/Hours to Repair**
 - 02-17-94/
– 3 hours

PR: Filling Out Forms-Definitions

- **Description:**
- **A description of the anomaly (not what was later found to cause it) when it occurred: The FEU became inoperative during BER Test A. This was evidenced by xxxxxxxxxx.**
- **Note: At times the actual assembly that is causing the problem may not be evident, but the key to starting the report is to write down what was initially observed (the anomaly) and what it should have been (the requirement).**

PR: Filling Out Forms-Definitions

- **Cause:** What was the primary failure (possible in a cascade of failures) that caused the anomaly.
- **Corrective action:** What was done to correct the anomaly and the primary failure and what was done to prevent them from happening again?
- **Other information:** disposition, assigned to, problem severity, degree of knowledge of problem, location, etc.

PR: Database Considerations

Rating of Criticality and Understanding of Problem

- **Criticality of Failure: while all anomalies should be reported some may be trivial while others may be extremely serious.**

Completely identify the item causing the problem.

- **(Unit / Box / Component) X (P/N / Model / S/N)**

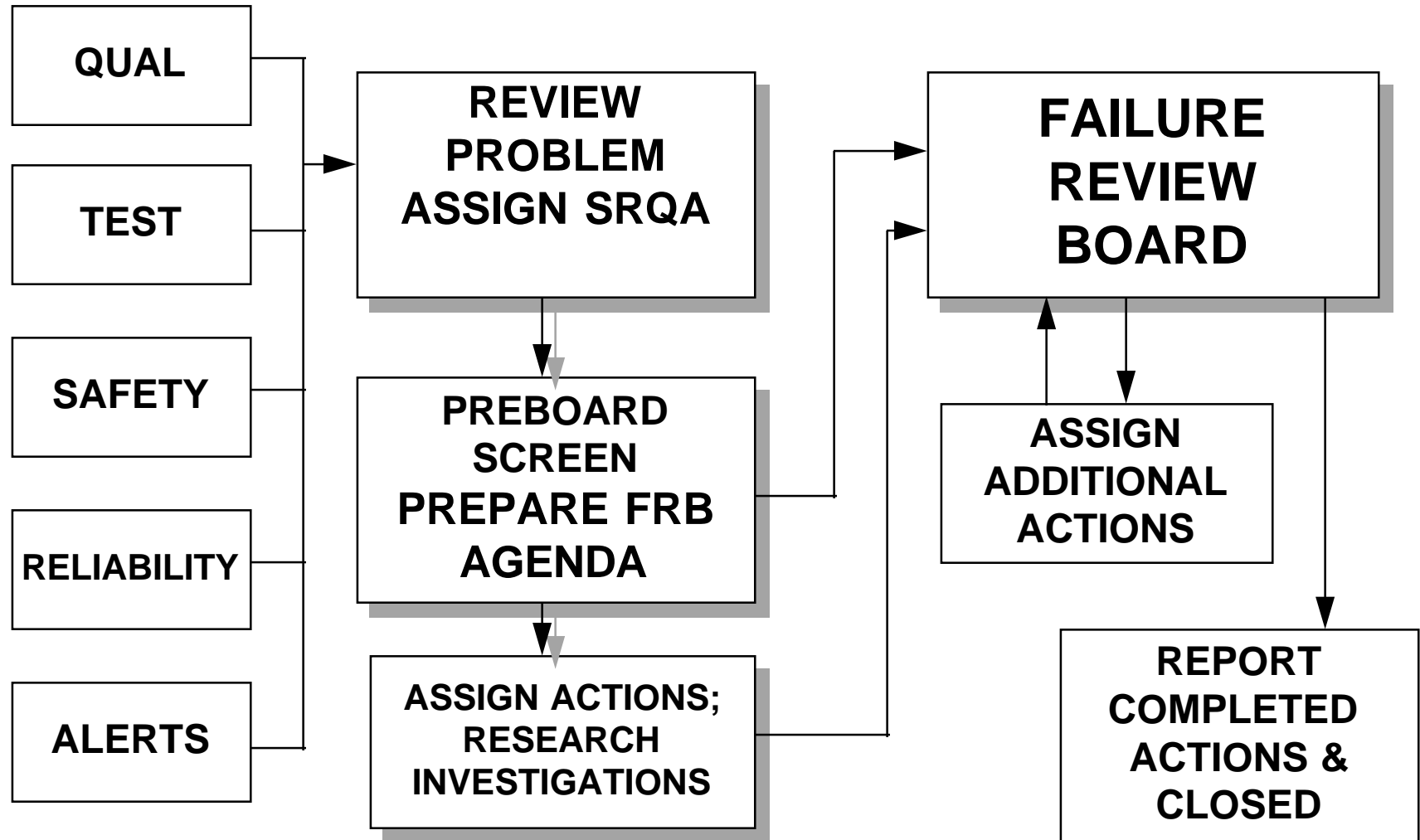
Special Data Fields

- **Levels of closure, personnel assigned to analysis, fail date, analysis date, product disposition, retest results.**

PR: Failure Review Board Procedure

(simplified)

PROBLEMS



PR: Importance of Independent Reviews

- **Validate completeness and thoroughness.**
- **Provide consistency of assessment across projects.**
- **Verifies analysis, including every impact of corrective action.**
- **Reviews corrective action for consistency with problem and analysis.**
- **Encourages adherence to rigorous closure process.**
- **Identify additional mission risks.**
- **Verifies data accuracy.**
- **Ensures that adequacy of corrective action is verified by retest etc.**

PR: Suggestions to Implement/ Improve a P/FR System

- **Provide Quality/Reliability Engineer to fill out Reports.**
- **Allow the engineer assigned to the problem to rate the severity.**
- **For a low severity, catalog the problem and close it out quickly.**
- **Provide training classes for everyone using the system.**
- **Promote the system by distributing useful results summarizing the problems, corrective actions and lessons learned.**

END

PR: Suggestions to Encourage Use.

- **Use standard nomenclature in the fields for box, component, system, subsystem, etc. TO FACILITATE SORTING AND RETRIEVAL.**
- **For the problem -- state what the symptoms were. Use narrative text. THIS WILL ENCOURAGE OTHERS TO READ IT.**
- **For the analysis -- give details in the problem solving methodology. “We thought the problem might be A, B or C. We decided to run test X to determine if it was A. Since A was eliminated we check the load history and material history to see if it was B or C. ...” THIS WILL HELP OTHERS TO SOLVE PROBLEMS AS WELL AND VERIFY YOU’RE PROCESS.**
- **Encourage others to read the PRs.**



LESSONS LEARNED

(11)+
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LESSONS LEARNED SYSTEM

- **A system to collect experience (lessons) from Defense, NASA and Industry that relate to problems that were experienced, how they were corrected and how they can be avoided in the future.**

The Purpose of NASA LL

- **The purpose of the NASA Lessons Learned Information System (LLIS) is to collect and make available for use by all who may derive benefit from the experiences of others, the lessons learned from almost forty years in the aeronautics and space business. Both government and industry have long recognized the need to document and apply the knowledge gained from past experience to current and future projects in order to avoid the repetition of past failures and mishaps.**
- **Through the LLIS, NASA seeks to facilitate the early incorporation of safety, reliability, maintainability, and quality into the design of flight and ground support hardware, software, facilities, and procedures.**

SOURCE: NASA GODDARD <http://envnet.gsfc.nasa.gov/ll/> 02/05/97 @6:53 pm est

LL: LESSONS LEARNED

- **A lesson learned is knowledge or understanding gained by experience. The experience may be positive or negative.**
- **The event is expressed in terms of an action to be taken to achieve positive results or avoid negative results.**
- **It must have real or assumed impact on operations and applicable in that it identifies a specific design, process, action or decision that reduces or eliminates the potential for mishaps.**
- **The data must be readily accessible and easy to understand.**

LL: Typical Systems

- **LLIS -- NASAwide Lessons Learned Information System.** Search for Web Site: Government>NASA>Goddard>Lessons Learned. Typical <<http://envnet.gsfc.nasa.gov/ll/>>
- **Air Force/FAA Automated Lessons Learned Capture and Retrieval System -- (ALLCARS)**
 - From ASC/CYM, Bldg. 17, 2060 Monahan Way, WPAFB, OH, 45433-6503, Phone (513) 255-3454
- **DOE -- US Department of Energy Lessons Learned** Search for Web Site: Government>DOE>Lessons Learned.
- **CALL -- Center for Army Lessons Learned** Search for Web Site: Government>ARMY>Lessons Learned or CALL
- **Navy Combined Automated Lessons Learned** Search for Web Site: Government>NAVY>Lessons Learned or NCALL.

LL: PROCEDURE FOR SUBMITTING

- **Any individual or organization may submit a lesson learned to the SR&QA or Safety and Mission Assurance office for review.**

LESSONS LEARNED FORMAT

- **Typical lessons learned are in the form of a database, either on line or disk based. The system:**
 - **Collects experienced based knowledge from mishap reports, alerts, project reports and other submittals.**
 - **Presents them in an understandable way with positive actions to avoid a problem or improve results.**

LESSON LEARNED FORM

- **Source Description**
- **Subject**
- **Facility**
- **Lesson Learned**
- **Action Required**
- **Applies to/Areas of Concern**
- **Description of Driving Event**
- **Submitter**

Form, samples (opt)

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LL: CONCLUSION

- **USE EACH FAILURE AS AN OPPORTUNITY TO IMPROVE YOUR PRODUCT!**

Through analysis and correction of the problem.

- **Identifying the root cause of each problem.**
- **Verifying by test that the problem has been corrected.**
- **Collecting the reports in a database and looking for trends and common problems.**

Through publishing the lessons learned to others. **END**

P fail report writing (opt.)

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Failure Write-up 1.

A technician reports that “during operation of the earth station (E/S) acceptance tests that the Transmit Frame Processor Card in the Modem Chassis experienced an intermittent failure. This was found by swapping a good card into the Modem whereupon the unit functioned acceptably. The primary Modulator Switch Processor was at first suspected but due to the nature of the fault, the Modem was finally isolated as the culprit.” He reports this has happened before so he asks you to help him fill out a problem report.

Failure Write-up 2.

During Electromagnetic Interference (EMI) testing of aircraft actuators all systems on units with coax cable performed adequately. One actuator added to the test (which was run with fibre optic cable) experienced one partial actuation during a sequence of 50 tests. After the test a technician found a break in the shield of the coax cable which fed the output card of the fibre optic cable. Since it was not part of the test but was only added later and the problem was obvious no further action was taken. Comment.